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Hurricanes Katrina and Rita and the Coastal Louisiana Ecosystem Restoration

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Summary

Hurricanes Katrina and Rita caused widespread damage and destruction to wetlands along the central Gulf Coast. Prior to these hurricanes, the U.S. Army Corps of Engineers had been seeking approval from the 109th Congress for a \$1.1 billion multi-year program to construct five projects that would help to restore portions of the coastal Louisiana ecosystem by slowing the rate of wetland loss and restoring some wetlands. This funding would also be used to continue planning several other related projects. The state of Louisiana and several federal agencies have participated in the development of this program. This report introduces this program, discusses whether it might have muted the impacts of a hurricane of the magnitude and paths of Katrina or Rita, and whether the devastation caused by both hurricanes might cause the Corps and other restoration supporters to propose either altering aspects of this proposed program, or expanding it. This report will be updated as more information becomes available about either the storms' effects on coastal Louisiana and its wetlands, or about any changes in the proposed program in response to these natural disasters.

Introduction

The 109th Congress has been considering provisions in legislation (S. 728 and H.R. 2864) that would authorize the U.S. Army Corps of Engineers (Corps) to implement numerous activities to slow the rate of coastal wetlands loss in Louisiana over the next decade. Both bills would authorize funding to implement a program that the Corps recommended in a November 2004 feasibility report. The Corps recommended \$1.1 billion for activities to be initiated immediately, and estimated an additional cost of \$0.9 billion for future work. Of the initial \$1.1 billion, \$828 million is to complete planning and construct five projects, called "near-term features," where the planning process is well along, and construction could be completed in about a decade. The remainder of this initial authorization would be spent on: monitoring program performance; building small demonstration projects (a maximum cost of \$25 million per project); exploring options to use dredged materials to create wetlands; and continued planning of 10 additional projects that would have to be authorized at a future date. Finally, additional funding

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would be provided to study six less well defined possible program elements for the future, termed “large-scale, long-term coastal restoration concepts.” The House version, passed by the full House on July 25, 2005, authorizes a total of \$1.218 billion, while the Senate version, reported by the Senate Environment and Public Works Committee, does not specify any dollar amounts, but authorizes the restoration program “substantially in accordance with” the report from the Corps. (For more information on this plan, see CRS Report RS22110, *Coastal Louisiana Ecosystem Restoration: The Recommended Corps Plan*, and to follow the legislative process, see CRS Issue Brief IB10133, *Water Resources Development Act (WRDA): Army Corps of Engineers Authorization Issues in the 109th Congress*.)

Background

The Corps recommendations for investments to slow wetland losses in November 2004 is the most recent effort in a series of federal and state actions over the past four decades, since a rapid rate of coastal wetlands loss was first documented in coastal Louisiana. It is now believed that more than 1.2 million acres of wetlands, an area approximately the size of Delaware, has been converted to open water since the 1930s. The remaining wetlands cover an area of about 3.5 million acres, an area slightly large than Connecticut. The U.S. Geological Survey has estimated that an additional 448,000 acres could be lost in coastal Louisiana by 2050 if no additional restoration projects are initiated. If the Corps’ program is implemented, it estimates that net wetland losses would be reduced to 170,000 acres by 2050.

These losses have been caused by a combination of human activities and natural factors. Human activities include dredging to develop and maintain navigation channels for ocean-going vessels, modifications to the landscape that support development of the oil and gas industry, damming throughout the Mississippi River watershed that holds back not only flood waters, but also sediments that had been deposited in coastal Louisiana, and building levees to protect areas near the river from flooding. Natural factors include higher sea levels and compaction of sediment around the Mississippi River delta. One important physical manifestation of all these changes is the increase of salt water intrusion into freshwater wetlands, which contributes to the elimination of the wetland vegetation.

Proposals to respond to these losses have centered on rebuilding the region’s coastal wetlands in ways that could reduce the ecological, economic, and social costs. The current set of proposals before Congress are somewhat independent of each other because of the large expanse of coastal Louisiana. This independence is in contrast to other large-scale ecosystem construction and restoration programs around the country, such as the south Florida Everglades restoration, where component projects are interrelated, and success depends on completing all the pieces in the program. One growing cost that results from these several decades of wetland losses is the diminished role that they can play in reducing the impact of hurricanes by absorbing storm surges and thereby decreasing flood elevations and wave energy.

The Corps’ recommended program includes projects centered in the wetlands south and southwest of New Orleans. None of the program activities are in the western portion of the Louisiana coast. In its analysis of the selected set of options and the many alternative proposals included in the November 2004 final report, there is almost no mention of hurricanes or an analysis which compares how these proposals might mitigate

the effects of a major hurricane. In making these recommendations in the final report, the District Engineer for New Orleans states, in the general introduction to the recommendations, that “I am convinced that the LCA [Louisiana Coastal Area] Plan would begin to reverse the current trend of degradation of Louisiana’s coastal ecosystem, support Nationally significant living resources, provide a sustainable and diverse array of fish and wildlife habitats, reduce nitrogen delivery to offshore gulf waters, provide infrastructure protection, and make progress towards a more sustainable ecosystem.”¹ This focus on the ecological improvements of rebuilding wetlands, and the social and economic benefits that accompany these improvements, does not incorporate the likely benefits associated with a reduction of storm damage by stabilizing coastal barriers, accumulating sediment that would lead to reestablishing wetland vegetation, and the like.

When both hurricanes struck, less than a month apart, Congress had not yet authorized any restoration program. However, two prototype projects, the wetland restorations at Davis Pond and Caernarvon Diversions, had been initiated under other authorities. Both diversions are located in the greater New Orleans area along the main channel of the Mississippi River. Fresh water from this river bearing sediment is periodically introduced into the diversion sites, which are large rectangular receptacle areas bounded by low levees. As the water sinks below the surface or evaporates, it leaves sediments and raises land elevation, which, in turn, provides an environment in which wetland habitat can be established. These two diversions are planned to add about 50,000 acres of wetlands over 50 years. As of mid-September, there has been no information about how these two diversion sites fared as a result of the hurricanes. As more information on these effects become available, it may help the Corps determine how future diversion projects might be designed, taking into account the potential effects of major storm events, and what effect the presence of these diversions have on surrounding areas in major storm events.

Katrina’s and Rita’s Effect on Restoration Planning: Back to the Future

In the wake of Hurricane Katrina, some supporters of restoration are calling for a more substantial program than the Corps is currently proposing and Congress is considering. They are calling for reconsideration of a \$14 billion restoration effort, as laid out in the *Coast 2050* Plan, which was released in 1998. This planning effort, which was led by the Corps and involved numerous federal and state agencies, resulted in 77 “restoration strategies” recommendations, to be completed over a 50-year time period. Many of these strategies are construction projects. The strategies would be distributed along the entire length of the Louisiana’s coastal area. The anticipated result of these strategies, if fully implemented, was to protect or restore almost 450,000 acres of wetlands. After Hurricane Rita, the calls for this larger response has grown.

To date, Congress has not considered legislation authorizing the *Coast 2050* Plan. Instead, in 2000, the Corps and the state began to develop a more modest set of proposals for projects that could be implemented over a 10-year time period. A draft was completed in October 2003, but never officially released. It included several options for

¹ U.S. Army Corps of Engineers. *Louisiana Coastal Area (LCA) Ecosystem Restoration Study*. Final Report. New Orleans, November, 2004. p. MR 6-1.

implementation with estimated costs that reportedly ranged between \$4.3 billion and \$14.7 billion. However, the Administration, represented by the Office of Management and Budget, reviewed these recommendations and cost estimates, then reportedly directed the Corps to come up with a less costly proposal; that is the proposal which Congress is currently considering.

Effects of Katrina and Rita on Louisiana's Coastal Wetlands and Barrier Islands

Documenting the effect of Hurricane Katrina and Hurricane Rita on coastal Louisiana will be a long process that is just starting. Coastal Louisiana is an extremely flat and dynamic physical environment where major storm events can greatly alter the surface features, especially wetlands, beaches and barrier islands. Some "before and after" photographs showing the damage caused by Hurricane Katrina, such as those on the U.S. Geological Survey's website [<http://www.nwrc.usgs.gov/hurricane/post-hurricane-katrina-photos.htm>] indicate that wetlands (and coastal barriers and beaches) have been replaced by open water over large areas. An initial estimate by scientists that has been widely reported in the press is that Hurricane Katrina converted to open water more than 30 square miles of a 133-square-mile area of marsh in the Breton Sound. This Sound lies to the east of New Orleans and near the area of greatest impact of this hurricane.

By contrast, Hurricane Rita made landfall along the western edge of the state. Coastal landforms here are dominated by cheniers, which are slightly elevated ridges that parallel to the coast and are vegetated by shrubs and trees. Cheniers block the flow of salt water from the ocean and have lead to extensive fresh water basins on the landward side, and brackish water and salt water marshes on the ocean side. In many coastal areas in this part of the state, there are several relic cheniers running parallel to each other and to the coast. Little information has been gathered about the impact of the hurricane and storm surge on this environment as yet.

However, some portion of the losses caused by both storms may only be temporary, as wetland vegetation was flattened by storm surge and strong wind, and coastal beach sand and sediment were redistributed by these same forces. In addition, in some locations where the storm deposited sediment, wetlands may emerge. The focus in the media continues to be, first and foremost, on the flooding in New Orleans, and then on the center of damage from Hurricane Katrina in coastal Mississippi, with much less attention to the small towns and sparsely populated areas east and south of New Orleans and along Louisiana's coast. By contrast, the initial reaction to Hurricane Rita is that it caused much less economic damage to population and business centers, and transportation networks. More information on coastal Louisiana should start to become available as scientists can access both storm areas and survey the physical changes.

The wetlands were protected from ocean storms in central and eastern portions of coastal Louisiana by a thin ribbon of coastal sand barriers and beaches along the shoreline. These barriers provide what is sometimes characterized as a speed bump which creates friction that helps to break up and slow down storm surge. It also provides a barrier to salt water, protecting freshwater wetland plants and ecology by keeping the water on the landward side of the barriers and beaches less saline than sea water.

The coastal barrier system in Louisiana has also been deteriorating for many of the same reasons as the wetlands, both human and natural. Stabilization and restoration of some of these barriers was recognized as critical to any successful effort to protect the wetlands behind these barriers. Hurricane damage to these barriers may greatly affect the overall restoration effort. Landward of where they were overtopped, flattened, or bisected by new inlets, it may be particularly challenging to reestablish wetlands because of the presence of hurricane-related changes to this landscape. Over time, some of these barriers may stabilize and rebuild in new locations, but these changes will not be clear for some time. Initial observations that has been reported in the press from a flyover of the Chandeleur Islands, a chain of barrier beaches and islands about 70 miles east of New Orleans, is that they were heavily damaged, but the water was receding from storm elevations when this flyover occurred, and it is not known whether these changes will be permanent, or whether these islands will start to recover in calmer conditions.

What If the Restoration Program Had Been Completed Before the Hurricanes?

Damage generally is most extensive along the east side of a hurricane storm track in the Gulf of Mexico, where the wind blows from south to north and the storm surge is most pronounced. In the case of Katrina, the storm track was just east of New Orleans, and the highest storm surge was documented to the east of that track. By contrast, within 100 miles of New Orleans west and northwest, such as in the nearby Baton Rouge area, the damage is far less severe and extensive. The same general configuration of damage occurred with Hurricane Rita, with the worst damage in western Louisiana, just to the east of the storm's track. If the entire first phase of the restoration program had been completed, that is, if Congress had authorized and the Corps had spent the entire \$1.1 billion, as recommended in the November 2004 Corps report, for a combination of construction and further investigations, it may be that these investments would have had little effect on the pattern or extent of flooding or other storm damage around the city of New Orleans, and only a limited effect on damage elsewhere. The stability of the levees and floodwalls around the city would not have been enhanced by any component of the restoration program, so this investment would not have affected a floodwall breaching or flooding in the city. Where the most severe damage occurred to the east of the city from Hurricane Katrina and in the western portion of the state from Hurricane Rita, the restoration program would have had little activity, at least in the initial phase. Perhaps these relationships between both hurricanes and the proposed restoration (and the two existing prototype diversions) should be examined to help inform any debate over future priorities for a restoration program.

The potential damage from any storm event, and the role the restoration would play in muting those damages, depends on specific characteristics of the storm event, including such factors as the storm's intensity, its precise track, the speed at which it is moving, and the tidal elevation at land fall. Scientists have pointed out that coastal wetlands cause friction to storm surge; one estimate is for every 2.7 miles of marsh this surge passes over, its elevation is reduced by a foot. Estimates from other scientists expressing a similar relationship is that storm surge is reduced by a foot in adjacent inland areas for every square mile (640 acres) of wetlands that are restored. A possible conclusion is that the restoration could have a great beneficial effect mitigating the damage to coastal Louisiana from storm events with some characteristics and especially near the coast. However, for

hurricanes with many combinations of characteristics, this set of projects may have little or no effect on reducing the impacts from the storm.

Possible Effect of Hurricane Katrina and Hurricane Rita on Restoration Efforts

Katrina may have had some adverse effects on the two diversions that have already been initiated to restore wetlands at Caernarvon and Davis Pond. However, no such effects have been reported as yet. How these restoration sites stood up to the forces of this hurricane could provide considerable insights into the diversion approach, and this information will be very helpful in planning future wetland restorations.

All the major restoration planning has been in response to wetland losses and coastal degradation within the Louisiana state boundaries. However, the physical processes at work and the track of Hurricane Katrina did not respect these boundaries, and caused extensive damage in coastal Mississippi and Alabama. The impact of this storm may cause Congress not only to consider how to move ahead with a restoration program for Louisiana, but also whether such an effort can be more effective if it includes components that would provide the same damage-mitigating benefits in coastal Mississippi and Alabama.

Even if Congress authorizes either the pending legislative proposal or some larger amount for restoration, physical changes on the ground will not be in place for decades. The five projects where authorization is currently pending are not anticipated to be completed for about a decade. Most of the other construction projects are much earlier in the planning process, and therefore completion will be further into the future. The time required for planning and engineering work that precedes actual construction can be completed could also be extended if the engineering resources of the Corps have to also address the many other project needs, such as levee enhancement, generated by Katrina. Under the best of circumstances, the array of projects in a complex and comprehensive program like *Coast 2050* could not be completed for decades.

Another consideration will be how policy and program responses to the flooding in New Orleans will be viewed in relation to the restoration effort. As stated earlier, little that is proposed in the current legislation would have had much effect on alleviating the causes behind the levee failures or moderating the rate or pattern at which the city was subsequently flooded. It does not appear that the many additional projects that were in the 1998 *Coast 2050* Plan would have a significant mitigating effect on the flooding associated with this specific natural disaster. If Congress makes the protection or “fortification” of New Orleans through levee improvements and other possible projects such as flood barriers its highest priority, then some financial and agency resources may be drawn away from other projects, such as those in the restoration efforts, that contribute only indirectly to protecting the city. This could reduce the scale of threat and damage to communities to the South. If Congress wishes to address both needs at the same time, then it may also want to consider setting priorities among the protection activities that it authorizes. At a minimum, Congress might consider asking the Corps to examine how each of these projects might mute future storm damage, and whether there are some modifications that could be made to these projects that would increase benefits of protecting the city or other south Louisiana communities.